STUDENT GUIDE
Lesson 2: Nutrient Detective Lab

Objective: To identify and quantify the presence of carbohydrates, lipids, and proteins in various health food samples.

Driving Question: Why might someone who exercises consume whey protein?

What do we still need to know to answer the Driving Question?

Part 1: Reading About Macromolecules

What are the three types of macromolecules?

Why are macromolecules important to athletes?

Part 2: Protocols for Testing Macromolecules

Simple Sugar Test: Benedict's Solution

Complex Sugar (Starch) Test: Lugol's Iodine Solution

Protein Test: Biuret Solution

Lipid Test: Sudan III Stain

Complete Table 1: Positive & Negative Results when Testing for the Presence of Macromolecules

Macromolecule	Chemical Test Name	Positive Test Color	Negative Test Color
Carbohydrates: Simple Sugars			
Carbohydrates: Starch			
Proteins			
Lipids			



Part 3: Preparing Samples for Testing

Your group will either need 16 test tubes or will wash and re-use the ones at your station to make the test samples for the next healthy food items. To prep your samples, use the following directions:

Liquid - pour it into a test tube until it is ¼ of the way full (less than half). Add 20mL of water to the test tube. Seal the test tube with your gloved thumb and vigorously shake to mix. After 30 seconds of shaking, allow the contents to settle for 1 minute.

Solid - use a mortar and pestle to grind the food into a fine powder if it is not already a powder. Add your sample to a test tube and add 20mL of water to the test tube. Seal the test tube with a clean gloved finger (not one used already) and vigorously shake to mix. After 30 seconds of shaking, allow the contents to settle for 1 minute.

Once you have prepared your samples, use the pH paper to test the pH of each one. Use a new piece of pH paper for each sample. Discard the pH paper after it has been used. Write the pH number on the lines above next to each sample name and circle if it is an acid, base, or neutral.

Look at the food items available for you to test. Choose 4 items to complete the macromolecule tests for. List the items you are testing below:

Sample 1:_____ pH_____ Acid, Base or Neutral (circle one)

Sample 2:_____ pH_____ Acid, Base or Neutral (circle one)

Sample 3:_____ pH_____ Acid, Base or Neutral (circle one)

Sample 4:_____ pH_____ Acid, Base or Neutral (circle one)



Part 4: Data Analysis

Sample 1:				
Chemical Test				
Macromolecule				
Color?				
Positive or Negative?				

Notes:

Sample 2:				
Chemical Test				
Macromolecule				
Color?				
Positive or Negative?				

Notes:

Sample 3:				
Chemical Test				
Macromolecule				
Color?				
Positive or Negative?				

Notes:

Sample 4:				
Chemical Test				
Macromolecule				
Color?				
Positive or Negative?				

Notes:



Part 5: Summary of Results

Analyze the data you have collected. Summarize your findings and discuss which health foods contain carbohydrates, lipids, and proteins.

How do the results of the macromolecule tests compare with the nutritional labels on the food packaging? Are there any discrepancies? What are some possible reasons if there are differences observed?

What are the limitations of the tests used in this lab for identifying macromolecules?

How can the information gained from these tests be used to make informed dietary choices?

How do the different macromolecules contribute to the overall caloric content of a food item?

If a food sample tested positive for both reducing sugars and starch, what does this indicate about the carbohydrate composition of the food?

What are the possible health implications of consuming foods high in lipids but low in proteins and carbohydrates, or vice versa?

How might the results of these tests be used in a real-world setting, such as in the food industry or healthcare?

How do the roles of carbohydrates, lipids, and proteins differ in the body, and why is it essential to have a balanced intake of each?



Part 6: Constructing an Explanation About Whey Protein Consumption

Use the findings from your investigation to construct an explanation to the Driving Question, Why might someone who exercises consume whey protein?